

WE CLAIM:

1. An electro-optical headset comprising:

an optical driver for receiving a first electrical signal representative of audio and for producing a modulated light signal based on the first electrical signal;

an optical link having a first end and a second end, the first end being coupled to the optical driver for receiving the modulated light signal;

an optical receiver coupled to the second end of the optical link for receiving the modulated light signal and demodulating the modulated light signal to produce a second electrical signal representative of the audio; and

a headset speaker element electrically connected with the optical receiver for receiving the second electrical signal and producing sound waves based on the second electrical signal.

2. The electro-optical headset of Claim 1, further comprising an electrical audio connector coupled with the optical driver for receiving the first electrical signal from electronic equipment.

3. The electro-optical headset of Claim 1, wherein the optical driver produces the modulated light signal by modulating a light source based on the first electrical signal.

4. The electro-optical headset of Claim 3, wherein the light source is a laser light emitting diode.

5. The electro-optical headset of Claim 3, wherein the optical receiver comprises a photo-voltaic cell.

6. The electro-optical headset of Claim 5, wherein the light source is a laser light emitting diode and the optical receiver comprises a demodulator circuit, and wherein the photo-voltaic cell also powers the demodulator circuit by receiving the modulated light signal from the laser light emitting diode.

7. The electro-optical headset of Claim 1, wherein the optical receiver comprises a semiconductor device selected from the group consisting of a photodiode and a phototransistor.

8. An electro-optical microphone comprising:
an optical transceiver for producing a source light and for receiving a modulated light signal, and for producing a first electrical signal representative of audio based on the modulated light signal;

an optical link having a first end and a second end, the first end being coupled to the optical transceiver for receiving the source light and for transmitting the modulated light signal; and

a microphone element coupled to the second end of the optical link for receiving the source light and modulating the source light to produce the modulated light signal representative of the audio, and wherein the microphone element is coupled to the second end of the optical link for transmitting the modulated light signal.

9. The electro-optical microphone of Claim 8, further comprising an electrical audio connector coupled with the optical transceiver for transmitting the first electrical signal to electronic equipment.

10. The electro-optical microphone of Claim 8, wherein the microphone element comprises:

an electrical microphone for receiving sound waves representative of audio and for producing a second electrical signal based on the sound waves;

an electro-optical shutter electrically connected to the electrical microphone for receiving the source light and modulating the source light to produce the modulated light signal, wherein the modulated light signal is representative of the second electrical signal; and

a directional optical coupler for receiving the source light from the second end of the optical link and directing the source light to the electro-optical shutter, and for receiving the modulated light signal from the electro-optical shutter and directing the modulated light signal to the second end of the optical link.

11. The electro-optical microphone of Claim 10, wherein the electro-optical shutter is a liquid crystal display element.

12. The electro-optical microphone of Claim 10, wherein the electrical microphone is a piezoelectric microphone.

13. The electro-optical microphone of Claim 8, wherein the microphone element comprises:

a diaphragm for receiving sound waves representative of the audio;

a translucent wedge attached to the diaphragm for receiving the source light and
5 modulating the source light to produce the modulated light signal based on the sound waves; and

a directional optical coupler for receiving the source light from the second end of the optical link and directing the source light to the translucent wedge, and for receiving the modulated light signal from the translucent wedge and directing the modulated light signal to the second end of the optical link.

14. The electro-optical microphone of Claim 8, wherein the microphone element is a reflective diaphragm for vibrating in response to receiving sound waves representative of the audio, and for reflectively modulating the source light to produce the modulated light signal based on the sound waves.

15. The electro-optical microphone of Claim 8, wherein the optical transceiver comprises a semiconductor device for receiving the modulated light signal, and wherein the semiconductor device is selected from the group consisting of a photodiode and a phototransistor.

16. The electro-optical microphone of Claim 8 wherein the source light is generated by a laser light emitting diode.

17. The electro-optical microphone of Claim 8 wherein the electro-optical transceiver comprises a demodulator circuit for demodulating the modulated light signal to produce the first electrical signal.

18. An electro-optical headset comprising:

an electro-optical interface for receiving a first electrical signal representative of first audio and for producing a first modulated light signal based on the first electrical signal, and for receiving a second modulated light signal and demodulating the second modulated light signal to produce a second electrical signal representative of second audio;

an optical link having a first end and a second end, the first end being coupled to the electro-optical interface for receiving the first modulated light signal and for transmitting the second modulated light signal;

an optical receiver coupled to the second end of the optical link for receiving the first modulated light signal, and for demodulating the first modulated light signal to produce a third electrical signal representative of the first audio;

a headset speaker element electrically connected with the optical receiver for receiving the third electrical signal and producing first sound waves based on the third electrical signal; and

a microphone element coupled to the second end of the optical link for receiving the first modulated light signal and for transmitting the second modulated light signal, and for modulating the first modulated light signal to produce the second modulated light signal representative of the second audio.

19. The electro-optical headset of Claim 18, further comprising at least one electrical audio connector coupled with the electro-optical interface for receiving the first electrical signal from electronic equipment and for transmitting the second electrical signal to the electronic equipment.

20. The electro-optical headset of Claim 18, wherein the optical receiver is a photo-voltaic cell.

21. The electro-optical headset of Claim 18 wherein the microphone element comprises:

an electrical microphone for receiving second sound waves representative of the second audio and for producing a fourth electrical signal based on the second sound waves;

an electro-optical shutter electrically connected to the electrical microphone for receiving the first modulated light signal and modulating the first modulated light signal to produce the second modulated light signal, wherein the second modulated light signal is representative of the fourth electrical signal; and

a directional optical coupler for receiving the first modulated light signal from the second end of the optical link and directing the first modulated light signal to the electro-optical shutter, and for receiving the second modulated light signal from the electro-optical shutter and directing the second modulated light signal to the second end of the optical link.

22. The electro-optical headset of Claim 21, wherein the electro-optical shutter is a liquid crystal display element.

23. The electro-optical headset of Claim 21, wherein the electrical microphone is a piezoelectric microphone.

24. The electro-optical headset of Claim 18 wherein the first modulated light signal is generated by a laser light emitting diode.

25. The electro-optical headset of Claim 18 further comprising:

a directional optical coupler for receiving the first modulated light signal from the second end of the optical link and directing the first modulated light signal to the optical receiver and the microphone element, and for receiving the second modulated light signal from the microphone element and directing the second modulated light signal to the second end of the optical link.

26. The electro-optical headset of Claim 25 further comprising:

an optical splitter for receiving the first modulated light signal from the directional optical coupler and directing the first modulated light signal to the optical receiver along a first optical path and directing the first modulated light signal to the microphone element along a second optical path.

27. The electro-optical headset of Claim 18, further comprising:

a directional optical coupler for receiving the first modulated light signal from the electro-optical interface and directing the first modulated light signal to the first end of the optical link, and for receiving the second modulated light signal from the first end of the optical link and directing the second modulated light signal to the electro-optical interface.

28. The electro-optical headset of Claim 18, wherein the electro-optical interface comprises:

a pulse width modulation circuit for receiving the first electrical signal and producing the first modulated light signal, wherein the first modulated light signal is pulse width modulated based on the first electrical signal; and

a sample-and-hold circuit for receiving the second modulated light signal and producing the second electrical signal, wherein the second modulated light signal is amplitude modulated based on the second audio.

29. The electro-optical headset of Claim 18 wherein the electro-optical interface comprises a semiconductor device for receiving the second modulated light signal, and wherein the semiconductor device is selected from the group consisting of a photodiode and a phototransistor.

30. A method for reproducing audio in an electro-optical headset, the method comprising:

receiving a first electrical signal representative of the audio;

producing a modulated light signal based on the first electrical signal;

5 transporting the modulated light signal through an optical link to an optical receiver;

demodulating the modulated light signal in the optical receiver to produce a second electrical signal representative of the audio; and

reproducing the audio in a headset speaker element by applying the second electrical signal to the headset speaker element.

31. The method of Claim 30, wherein the producing step comprises:

pulse width modulating a laser light emitting diode based on the first electrical signal to produce the modulated light signal.

32. The method of Claim 30, wherein the demodulating step comprises:

receiving the modulated light signal from the second end of the optical link in a photo-voltaic cell, wherein the photo-voltaic cell produces the second electrical signal representative of the audio.

33. A method for receiving audio from an electro-optical microphone, the method comprising:

producing a source light in an optical transceiver;

transporting the source light through an optical link from the optical transceiver to a

5 microphone element;

modulating the source light in the microphone element to produce a modulated light signal representative of the audio;

transporting the modulated light signal through the optical link from the microphone element to the optical transceiver; and

10 demodulating the modulated light signal in the optical transceiver to produce a first electrical signal representative of the audio.

34. The method of Claim 33, wherein the modulating step comprises the steps of:

receiving sound waves representative of the audio in an electrical microphone;

producing a second electrical signal based on the sound waves in the electrical microphone; and

5 attenuating the source light by an electro-optical shutter in response to the second electrical signal to produce the modulated light signal.

35. A system comprising:

a mobile station;

an electro-optical interface for receiving a first electrical signal from the mobile station representative of first audio, and for producing a first modulated light signal based on the first

5 electrical signal, and for receiving a second modulated light signal and demodulating the second modulated light signal to produce a second electrical signal for transmission to the mobile station representative of second audio;

an optical link having a first end and a second end, the first end being coupled to the electro-optical interface for receiving the first modulated light signal and for transmitting the
10 second modulated light signal;

an optical receiver coupled to the second end of the optical link for receiving the first modulated light signal, and for demodulating the first modulated light signal to produce a third electrical signal representative of the first audio;

a headset speaker element electrically connected with the optical receiver for receiving
15 the third electrical signal and producing first sound waves based on the third electrical signal;
and

a microphone element coupled to the second end of the optical link for receiving the first modulated light signal and for transmitting the second modulated light signal, and for modulating the first modulated light signal to produce the second modulated light signal representative of the
20 second audio.

36. The system of Claim 35 wherein the microphone element comprises:

an electrical microphone for receiving second sound waves representative of the second audio and for producing a fourth electrical signal based on the second sound waves;

an electro-optical shutter electrically connected to the electrical microphone for receiving
5 the first modulated light signal and modulating the first modulated light signal to produce the

second modulated light signal, wherein the second modulated light signal is representative of the fourth electrical signal; and

a directional optical coupler for receiving the first modulated light signal from the second end of the optical link and directing the first modulated light signal to the electro-optical shutter,
10 and for receiving the second modulated light signal from the electro-optical shutter and directing the second modulated light signal to the second end of the optical link.

37. The system of Claim 36, wherein the electro-optical shutter is a liquid crystal display element.

38. The system of Claim 36, wherein the electrical microphone is a piezoelectric microphone.

39. The system of Claim 35 wherein the first modulated light signal is generated by a laser light emitting diode.

40. An electro-optical headset comprising:

an optical driver for receiving a first electrical signal representative of audio and for producing a modulated light signal based on the first electrical signal, wherein the optical driver produces the modulated light signal by modulating a laser light emitting diode based on the first
5 electrical signal;

an optical link having a first end and a second end, the first end being coupled to the optical driver for receiving the modulated light signal;

an photo-voltaic cell coupled to the second end of the optical link for receiving the modulated light signal and demodulating the modulated light signal to produce a second
10 electrical signal representative of the audio; and

a headset speaker element electrically connected with the optical receiver for receiving the second electrical signal and producing sound waves based on the second electrical signal.

41. An electro-optical microphone comprising:

an optical transceiver for producing a source light and for receiving a modulated light signal, and for producing a first electrical signal representative of audio based on the modulated light signal, and wherein the source light is generated by a laser light emitting diode;

5 an optical link having a first end and a second end, the first end being coupled to the optical transceiver for receiving the source light and for transmitting the modulated light signal;

an electrical microphone for receiving sound waves representative of audio and for producing a second electrical signal based on the sound waves;

10 a liquid crystal display element electrically connected to the electrical microphone for receiving the source light and modulating the source light to produce the modulated light signal, wherein the modulated light signal is representative of the second electrical signal; and

15 a directional optical coupler for receiving the source light from the second end of the optical link and directing the source light to the liquid crystal display element, and for receiving the modulated light signal from the liquid crystal display element and directing the modulated light signal to the second end of the optical link.

42. An electro-optical headset comprising:

a pulse width modulation circuit for receiving a first electrical signal representative of first audio and producing a first modulated light signal from a laser light emitting diode, wherein the first modulated light signal is pulse width modulated based on the first electrical signal;

5 a sample-and-hold circuit for receiving a second modulated light signal in a photo-detector and producing a second electrical signal representative of second audio, wherein the second modulated light signal is amplitude modulated based on the second audio;

10 a first directional optical coupler for receiving the first modulated light signal from the pulse width modulation circuit and directing the first modulated light signal to the first end of the optical link, and for receiving the second modulated light signal from the first end of the optical link and directing the second modulated light signal to the photo-detector in the sample-and-hold circuit;

15 an optical link having a first end and a second end, the first end being coupled to first directional optical coupler for receiving the first modulated light signal and for transmitting the second modulated light signal;

a second directional optical coupler coupled to the second end of the optical link for receiving the first modulated light signal from the second end of the optical link and for transmitting the second modulated light signal to the second end of the optical link;

20 an photo-voltaic cell coupled to the second directional optical coupler for receiving the first modulated light signal, and for demodulating the first modulated light signal to produce a third electrical signal representative of the first audio;

a headset speaker element electrically connected with the photo-voltaic cell for receiving the third electrical signal and producing first sound waves based on the third electrical signal;

an optical splitter for receiving the first modulated light signal from the second
25 directional optical coupler and directing the first modulated light signal to the photo-voltaic cell
along a first optical path;

an electrical microphone for receiving second sound waves representative of the second
audio and for producing a fourth electrical signal based on the second sound waves
representative of the second audio; and

30 a liquid crystal display element electrically connected to the electrical microphone for
receiving the first modulated light signal along a second optical path from the optical splitter and
modulating the first modulated light signal to produce the second modulated light signal, wherein
the second modulated light signal is representative of the fourth electrical signal, and wherein the
second modulated light signal traverses a third optical path and is received by the second
35 directional optical coupler for transmission to the second end of the optical link.